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AIRCRAFT AND GROUND MEASUREMENTS OF HYDROPEROXIDES DURING THE MILAGRO FIELD CAMPAIGN

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ABSTRACT

Mixing ratios of hydrogen peroxide and hydroxymethyl hydroperoxide were determined aboard the U.S. Department of Energy G-1 Research Aircraft during the March, 2006 Max-Mex/MILAGRO field campaign in Mexico. Ground measurements of total hydroperoxide were made at the T1 site at Universidad Technologica de Tecámac, about 35 km NW of Mexico City. Aloft, hydrogen peroxide mixing ratios near the source region generally were near 1 ppbv and hydroxymethyl hydroperoxide concentrations were at or near the detection limit of 0.38 ppbv. At the T1 site, the average hydroperoxide concentrations were typically 1 to 2 ppbv. Such concentrations are much lower than predicted from photochemical models based on the 2003 Mexico City study. Strong southerly flow resulted in transport of pollutants from the T0 to T1 and T2 surface sites on several flight days. On these occasions, we observed that peroxide concentrations aloft progressively decreased as the G-1 flew downwind, consistent with the low or negative net peroxide production rates computed using a photochemical box model. The pervasive low hydrogen peroxide concentrations are a consequence of the lack of availability of its precursor HO_2, whose concentration is suppressed through reaction with the extremely high concentrations of NO in the Mexico City plateau. In contrast, higher values of peroxide were observed at takeoff and landing near Veracruz, a site with higher humidity and much lower NO_x concentrations.
